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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 10/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No:

10/047,554

Applicant(s)

WOJTCZAK ET AL.

Examiner

Lynette T. Umez-Eronini

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-56 is/are pending in the application.
- 4a) Of the above claim(s) 30-55 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 and 56 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 30-55 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3, 4, & 6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-29 and 56, drawn to a cleaning CMP formulation, classified in class 252, subclass 79.1.
 - III. Claims 30-55, drawn to method for making a semiconductor, classified in class 438, subclass 706.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case the product as claimed can be used in a materially different process of using that product such as one that does not require plasma etching a metallized layer from a wafer surface.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Margaret Chappius on August 8, 2003 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-29 and 56. Affirmation of this election must be made by applicant in replying to this Office action. Claims 30-55 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Objections

6. Claim 14 is objected to because of the following informalities: Typographical error in "12. TEAHF". Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1, 4, 6, 10, 12-16, and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The "%" of the formulation is indefinite for failing to specify the units.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1, 2, 4-10, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leon et al. (US 6,030,932).

Leon teaches, "Non-corrosive cleaning compositions that are aqueous based and useful for removing . . . CMP residues from a substrate. . . . Another cleaning composition comprises: . . . an amine, . . . at least one fluorine-containing compound; and . . . water" (Abstract and column 4, lines 32-34). "The fluorine-containing compound in the above composition can be selected from acid fluorides, fluorinated salts, polyammonium fluoride salts and mixtures thereof. Preferred acid fluorides includes hydrogen fluoride, (HF) . . . Preferred fluoride salts are ammonium fluoride, ammonium bifluoride (same as applicant's fluoride source in **claims 1, 4, 5**), . . . (column 4, lines 50-59). Amines that may be used as a component in the cleaning compositions include alkanolamines such as monoethanolamine include . . . monoethanolamine, diethanolamine, triethanolamine . . ., and the like, . . . and other optional components of

the cleaning composition)" (column 5, lines 31-53). The said amines are the same as applicant's organic amine, **in the present claims 7 and 12**. "Another optional agent . . . is a corrosion inhibitor. The preferred corrosion inhibitors are lactic acid, . . ." (column 6, lines 8-11), which is same as applicant's metal chelating agent as **in claims 2 and 9** and which further reads on said formulation comprises from about 0 to about 5.0 % metal chelating agent, **in claim 8**. The above aforementioned reads on,

A post CMP cleaning formulation comprising an organic amine, a fluoride source and water, **in claim 1** and said formulation comprises from about 0 to about 10% nitrogenous component, **in claim 10**.

Leon differs in failing to specify 70% to 98% water, **in claim 1**; fluoride source comprises 0.1 to about 5.0% of the formulation, **in claim 4**; 1 to 15% organic amine, **in claim 6**; and the percent concentrations as recited **in claim 12**. Variations in the concentration of water and any other component of the cleaning formulation provide evidence that the concentration of a composition is a so-called "result effective variable."

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Leon by using varying concentrations of the cleaning components since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art., In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

12. Claims 3 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leon (US '932) as applied to claim 1 above, and further in view of Schonauer (US 5,662,769).

Leon differs in failing to teach the cleaning formulation comprises a nitrogenous component, in claim 3 and the nitrogenous component is selected from the group consisting of the compounds as recited in claim 11.

Schonauer teaches, "... contaminants introduced ... by the CMP processing, ... , can be removed from the wafer by a cleaning solution containing ... EDTA ... (column 6, lines 13-22), which is same as applicant's nitrogenous component).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Leon by employing Schonauer's EDTA for the purpose of releasing all buried contaminants from beneath the (wafer) surface (Schonauer, column 6, lines 19-22).

13. Claims 17-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leon (US '932) in view of Schonauer (US 5,662,769).

Leon teaches, "Non-corrosive cleaning compositions that are aqueous based and useful for removing ... CMP residues from a substrate. ... Another cleaning composition comprises: ... an amine, ... at least one fluorine-containing compound; and ... water" (Abstract and column 4, lines 32-34). "The fluorine-containing compound in the above composition can be selected from acid fluorides, fluorinated salts, polyammonium fluoride salts and mixtures thereof. Preferred acid fluorides includes

hydrogen fluoride, (HF) . . . Preferred fluoride salts are ammonium fluoride, ammonium bifluoride, . . . (column 4, lines 50-59). Amines that may be used as a component in the cleaning compositions include alkanolamines such as monoethanolamine, . . . and other optional components of the cleaning composition)" (column 5, lines 31-53). "Another optional agent . . . is a corrosion inhibitor. The preferred corrosion inhibitors are lactic acid (same as applicant's metal chelating agent), . . . (column 6, lines 8-11). The above aforementioned reads on,

A semiconductor wafer cleaning formulation comprising the following components: fluoride source, organic amine(s), carboxylic acids, water, and 0 – 21% metal chelating agent(s), **in claim 17**; a fluoride species as selected from the group consisting of fluoride compounds as recited **in claims 18 and 22**; an organoamine such as monoethanolamine, **in claims 19 and 23**; and at least one metal chelating agent selected from the group consisting of the compounds as recited **in claim 21**.

Leon differs in failing to teach the cleaning formulation comprises a nitrogenous component selected from nitrogen-containing carboxylic acids and imines, **in claims 17, 20, 24, and 25**.

Schonauer teaches, ". . . contaminants introduced . . . by the CMP processing, . . . , can be removed from the wafer by a cleaning solution containing . . . EDTA (same as applicant's nitrogenous component), . . . (column 6, lines 13-22).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Leon by employing

Schonauer's EDTA for the purpose of releasing all buried contaminants from beneath the surface (Schonauer, column 6, lines 19-22).

Leon in view of Schonauer differs in failing to specify percentage by weight ranges of 1-35 fluoride source, 20-60 organic amine(s), 0.1-40 nitrogenous component, 0.1-40% carboxylic acids and imines, and 20-50 water, in **claim 17**. Varying the concentration of water and any other component of the cleaning formulation provides evidence that the concentration of a composition is a so-called "result effective variable."

It is the examiner's position that it would have been obvious to modify Leon in view of Schonauer by using varying concentrations of the cleaning components since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art., In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

14. Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leon (US '932) in view of Schonauer (US '769) as applied to claim 17 above, and further in view of Wojtczak et al. (WO 98/00244).

Leon in view of Schonauer differs in failing to teach the said formulation includes a metal chelating agent of the formula: X-CHR-Y, in **claim 26** and to specify X and Y is independently selected from the functional groups as recited in **claim 27**.

Wojtczak teaches, "A semiconductor cleaning formulation . . ." (Abstract). "Other 1,3-dicarbonyl compounds and related compounds . . . have the following general

structure: -CHR-Y (same as applicant's metal chelating agent formula) . . ." (page 7, lines 6-10).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Leon in view of Schonauer by using compounds having the said structure, -CHR-Y, as taught by Wojtczak's for the purpose of removing inorganic residues (page 2, lines 6-12).

15. Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leon (US 6,030,932) in view of Schonauer (US '769).

Leon also teaches, "Non-corrosive cleaning compositions that are aqueous based and useful for removing . . . CMP residues from a substrate. . . . Another cleaning composition comprises: . . . an amine, . . . at least one fluorine-containing compound; and . . . water" (Abstract and column 4, lines 32-34). "The fluorine-containing compound in the above composition can be selected from acid fluorides, fluorinated salts, polyammonium fluoride salts and mixtures thereof. Preferred acid fluorides includes hydrogen fluoride, (HF) . . . Preferred fluoride salts are ammonium fluoride, ammonium bifluoride, . . . (column 4, lines 50-59). Amines that may be used as a component in the cleaning compositions include alkanolamines such as monoethanolamine, . . . and other optional components of the cleaning composition)" (column 5, lines 31-53). "Another optional agent . . . is a corrosion inhibitor. The preferred corrosion inhibitors are lactic acid (same as applicant's metal chelating agent), . . . (column 6, lines 8-11). The above further reads on,

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A wafer cleaning formulation, including (i) a fluoride source, (ii) at least one organic amine, (iv) water, and optionally at least one metal chelating agent.

Leon differs in failing to teach the cleaning formulation comprises a nitrogenous component selected from nitrogen-containing carboxylic acids and imines.

Schonauer teaches, "... contaminants introduced ... by the CMP processing, ... can be removed from the wafer by a cleaning solution containing ... EDTA (same as applicant's nitrogenous component), ..." (column 6, lines 13-22).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Leon by employing EDTA for the purpose of releasing all buried contaminants from beneath the surface (Schonauer, column 6, lines 19-22).

Allowable Subject Matter

16. Claims 13-16, 28 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

17. The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach PMDETA (pentamethyldiethylenetriamine) in combination with the components as recited in claims 13-16; a metal chelating agent having the formula, $R_1R_2R_3R_4N^+O_2CCF_3$, in which R groups are hydrogen or aliphatic; and a nitrogenous component having the formula, $COOH-CH_2-NRR'$, in which R and R' is selected from the group consisting of hydrogen, alkyl, aryl, and carboxylic acids, respectively in a cleaning formulation.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and 703-972-9311 for After Final communications.

Lynette T. Umez-Eronini

ltue

September 27, 2003